Hundreds of persons agree as to having experienced a distinct shock, their impressions varying according to the positions occupied by the observers. Those inhabiting the solid granite structures of the lower town conceived that heavy masses of furniture were overturned and moved in the apartments above or below them: they were not, however, so conscious of vibratory motion as those in the less substantial houses of the upper part of the town, or as those in the open air. In many houses, this vibratory motion was so violent as to cause much alarm, and was accompanied by crashing sounds, as though roofs and chimneys were falling; in some instances, chimney-pots were thrown down; suspended lamps were observed to wave; bells rang spontaneously; the vane of the town church waved, and one of its bells struck twice.

Persons in the open air were sensible of an undulatory motion, tending from the S.W., which occasioned unsteadiness of footing, and in some cases a transient feeling of nausea. A steam-engine in the Serk mines was remarked to suspend one out of its usual five strokes per minute; the engineer was alarmed lest this should be a precursor of bursting of the boiler. The massive granite works of St. Sampson's quay were so shaken, that glass vessels situated on various parts were thrown off. Two gentlemen engaged in Daguerreotype experiments on the ramparts of a fortification founded on a solid granite rock, felt the whole to vibrate. The crews of sailing-vessels beating up in the "roads," also felt the shock; those below rushing on deck under the impression that the vessels had struck on a rock.

The testimony of a great number of witnesses leaves no doubt as to the distinctness and strength of the shock. It was also felt, though in a slighter degree, in the neighbourhood of St. Malo, and near Brixham in Devonshire.

January 18, 1844.

SIR J. W. LUBBOCK, Bart., V.P., in the Chair.

"On a new Method of Analysis." By George Boole, Esq. Communicated by S. Hunter Christie, Esq., Sec. R.S., &c.

The purport of this paper is to exhibit a new form of analysis, and to found upon it a new theory of Linear Differential Equations, and of Generating Functions. The peculiarity in the form of the analysis consists in the linear differential equation, instead of being represented, as it has hitherto been, under the type

$$X_0 \frac{d^n u}{d x^n} + X_1 \frac{d^{n-1} u}{d x^{n-1}} \ldots\ldots + X_n u = X,$$

X_0, X_1, &c. being functions of the independent variable x, being exhibited in the form

$$f_0 (D) u + f_1 (D) \varepsilon^{\theta} u \ldots\ldots + f_s (D) \varepsilon^{r\theta} u = U;$$

in which $\varepsilon^{\theta} = x$, and $f_0 (D)$, $f_1 (D)$, &c. imply functional combina-

tions of the symbol D, which, for the sake of simplicity, is written in place of $\frac{d}{d\theta}$. This the author calls the exponential form of the equation; and he, in like manner, designates the analogous forms of partial and of simultaneous equations. What he conceives to be the great and peculiar advantage of the exponential form, both as respects the solution of linear differential equations, and the theory of generating functions, is that the necessary developments, transformations and reductions are immediately effected by theorems the expression of which is independent of the forms of the functions f_0 (D), f_1 (D), &c. Accordingly it may be shown that various formulæ which have been given for the solution of linear differential equations, with those in which Laplace's theory of generating functions is comprised, interpreted into the language of the author, are but special cases of theorems dependent on the exponential form above stated, and which are susceptible of universal application.

The common method of effecting the integration of linear differential equations in series fails when the equation determining the lowest index of the development has equal or imaginary roots. In a particular class of such equations of the second order, Euler has shown that log. x is involved in the expression of the complete integral: but this appears to be merely a successful assumption; and the rule of integration demonstrated in the present paper admits of no such cases of exception whatever.

The finite solution of linear differential equations may be attempted by resolution of the proposed equation into a system of equations of an inferior order. This method applied to the linear equation under its usual forms leads to the well-known solution of equations with constant coefficients: and when applied to the same equation under the exponential form, it gives a result embracing the solution not only of equations with constant coefficients, but also of a large class of equations with variable coefficients.

The author treats,—1st, of the solution of linear differential equations, total and partial, in series; 2ndly, of their finite integration; 3rdly, of the theory of series, or inverse method of development; 4thly, of linear equations of differences, total and partial, of certain miscellaneous applications, chiefly in the field of definite integrals, single and multiple.

January 25, 1844.

SIR J. W. LUBBOCK, Bart., V.P., in the Chair.

"A Description of an extensive Series of the Water Battery; with an account of some Experiments made in order to test the relation of electrical and chemical action which takes place before and after completion of the Voltaic Circuit." By John P. Gassiot, Esq., F.R.S.

In a former paper, which was printed in the Philosophical Transactions for 1839, the author described a series of experiments made